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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/693,619	10/24/2003	Erlend Ronnekleiv	WEAT/0349	1501
36735	7590	12/29/2005	EXAMINER	
PATTERSON & SHERIDAN, L.L.P. 3040 POST OAK BOULEVARD, SUITE 1500 HOUSTON, TX 77056			DETSCHER, MARISSA	
			ART UNIT	PAPER NUMBER
			2877	

DATE MAILED: 12/29/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

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Office Action Summary	Application No.	Applicant(s)	
	10/693,619	RONNEKLEIV, ERLEND	
	Examiner	Art Unit	
	Marissa J. Detschel	2877	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 24 October 2003.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-32 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1,2,5-7,9-11,20,22,23 and 27-29 is/are rejected.
- 7) ☒ Claim(s) 3,4,8 12-21, 24-27, and 30-32 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
 Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
 Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Specification

The disclosure is objected to because of the following informalities:

The very last line of paragraph 4 on page 2 of the specification that reads "A fiber-optic interferometer is typically formed by two reflectors, each placed at the" is repeated as the first line of page 5. One of these lines should be removed.

Appropriate correction is required.

Claim Objections

Claims 15, 20, and 27 are objected to because of the following informalities:

As to claim 15, the phrase "interrogating optical reference device" in the third line of this claim should read "interrogating an optical reference device."

As to claim 20, the phrase "interrogate the sensor with light from light" in the sixth line of this claim should read "interrogate the sensor with light from the light."

As to claim 27, the phrase "from light source" at the beginning of the seventh line of this claim should read "from the light source."

Furthermore, as to claim 27, the limitation "the downhole parameter" appears in line 4 of this claim, and there is insufficient antecedent basis for this limitation.

Appropriate correction is required.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1, 2, 5-7, 20, 22, and 23 are rejected under 35 U.S.C. 102(b) as being anticipated by Davis et al. (USPN 6,403,949).

Davis discloses a device that measures wavelengths of signals, and wavelength and frequency measurements of a device exemplify the same concept. Therefore, the device of Davis can also be used to measure frequencies.

Regarding claim 1, Davis discloses a method for sensing, comprising:

Interrogating at least one optical sensor (108, 110, 112) (column 8, lines 28-32);

Interrogating at least one optical reference device (206b) co-located with the optical sensor (Figure 6) (column 8, lines 28-32);

Extracting a sensor optical frequency parameter from a signal received from the sensor (column 7, lines 65-67);

Extracting a reference optical frequency parameter from a signal received from the reference device (column 9, lines 15-21); and

Generating a corrected sensor optical frequency parameter based on the sensor and reference optical frequency parameters (column 9, line 22 to column 10, line 20 and column 4, lines 32-41).

In regards to claim 2, the optical sensor of Davis' device is sensitive to at least one measurand (temperature and pressure – column 8, lines 11-13)) and the reference device is insensitive to the at least one measurand (temperature only – column 8, lines 34-37).

Regarding claim 5, at least one of the optical sensors and the reference device of Davis comprises an optical waveguide Bragg grating (206b, 108, 110, 112).

In regards to claim 6, the optical sensor and the reference device of Davis each comprise a Bragg grating optically coupled to a common lead waveguide (column 8, lines 47-55).

Regarding claim 7, at least one of the sensor optical frequency parameter and reference optical frequency parameter comprises a change in an optical waveguide Bragg grating center frequency (column 2, lines 25-32). The device uses wavelengths of peaks in a spectrum of light to compensate for systematic error in the sensor measurements.

In regards to claim 20, Davis discloses a sensor system comprising:

A light source (204a) for generating interrogating light signals;

At least one optical sensor (108, 110, 112) optically coupled with the light source;

At least one optical reference device (206b) co-located with the sensor and optically coupled with the light source; and

Control circuitry (Figure 6) configured to interrogate the sensor with light from the light source to generate a sensor signal (column 8, lines 28-32), interrogate the reference device with light from the light source to generate a reference signal (column 8, lines 28-32), extract a sensor optical frequency parameter from the sensor signal (column 7, lines 65-67), extract the reference optical frequency parameter from the reference signal (column 9, lines 15-21), and generate a corrected sensor optical

frequency parameter based on the sensor and reference optical frequency parameters (column 9, line 22 to column 10, line 20 and column 4, lines 32-41).

Regarding claim 22, the at least one optical reference comprises an optical waveguide Bragg grating (206b), and the reference optical frequency parameter comprises a change in center frequency of the optical waveguide Bragg grating (column 2, lines 25-32). The device uses wavelengths of peaks in a spectrum of light to compensate for systematic error in the sensor measurements.

In regards to claim 22, the reference and sensor of Davis' device share a common lead waveguide (Figure 6 and column 8, lines 47-55).

Claims 10, 11, 27, and 29 are rejected under 35 U.S.C. 102(b) as being anticipated by Kersey (USPN 5,227,837).

In regards to claim 10, Kersey discloses a method for sensing at least one parameter comprising:

Interrogating a sensor interferometer (23) to generate a sensor signal responsive to the parameter (column 2, line 68 to column 3, line 3);

Interrogating a reference interferometer (27) co-located with the sensor interferometer to generate a reference signal insensitive to the parameter (column 3, lines 3-6, column 3, lines 19-30);

Extracting a sensor phase from the sensor signal (column 3, line 66 to column 4, line 1);

Extracting a reference phase from the reference signal (column 4, lines 1-4); and

Generating a corrected sensor phase based on the sensor phase and the reference phase

Regarding claim 11, the sensor interferometer and reference interferometer of Kersey's device share a common lead optical waveguide (17).

In regards to claim 27, Davis discloses a sensor system comprising:

A light source for generating interrogating light signals (15);

At least one sensor interferometer (23) sensitive to a parameter (29);

At least one reference interferometer (27) co-located with the sensor interferometer and configured to be insensitive to the parameter; and

Control circuitry (55) configured to interrogate the sensor interferometer with light from the light source to generate a sensor signal (column 2, line 68 to column 3, line 3), interrogate the reference interferometer with light from the light source the generate a reference signal (column 3, lines 3-6, column 3, lines 19-30), extract a sensor phase from the sensor signal (column 3, line 66 to column 4, line 1), extract the reference phase from the reference signal (column 4, lines 1-4), and generate a corrected sensor phase based on the sensor and reference phases (column 5, line 55 to column 7, line 13).

Regarding claim 29, the sensor interferometer and reference interferometer share a common lead waveguide (17).

Claim Rejections - 35 USC § 103

Regarding claims 9, 27, and 28, it has been held that a recitation with respect to the manner in which a claimed apparatus is intended to be employed does not

differentiate the claimed apparatus from a prior art apparatus satisfying the claimed structural limitations. *Ex parte Masham*, 2 USPQ2d 1647 (1987). The sensing device and method claimed is intended to be used to measure parameters in an environment, such as the environment of a wellbore.

Allowable Subject Matter

Claims 3, 4, 8, 12-14, 21, 24-26, and 30-32 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Claims 15-19 are objected to under the minor informalities as stated in this office action, but would be allowable if rewritten to overcome these objections.

The following is a statement of reasons for the indication of allowable subject matter:

As to claims 3, 4, 24, and 25, the prior art of record, taken alone or in combination, fails to disclose or render obvious a method of scaling a reference optical frequency parameter by multiplying the parameter by a factor based on the ratio of the light signal frequencies used to interrogate the reference and sensor devices, along with the rest of the limitations of said claims.

As to claims 8, 21, and 26, the prior art of record, taken alone or in combination, fails to disclose or render obvious the use of a sensor laser as a reference device in a method for sensing, along with the rest of the limitations of said claims.

As to claims 12-14 and 30-32, the prior art of record, taken alone or in combination, fails to disclose or render obvious a method of scaling a reference phase

by multiplying the phase by a factor based on the ratio of the light signal frequencies used to interrogate the reference and sensor devices, along with the rest of the limitations of said claims.

As to claims 15-19, the prior art of record, taken alone or in combinations, fails to disclose or render obvious the method of interrogating a reference device and optical sensor co-located with each other, and correcting the sensor signal for errors due to Doppler shifts based on the reference signal.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Marissa J. Detschel whose telephone number is 571-272-2716. The examiner can normally be reached on M-F 8:30am-5:00pm.

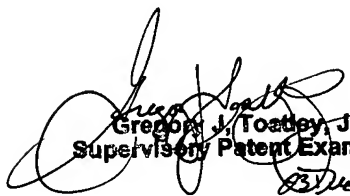
If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Gregory J. Toatley, Jr. can be reached on 571-272-2059. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

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Marissa J Detschel
December 22, 2005
MJD


Gregory J. Tooley, Jr.
Supervisory Patent Examiner
12/22/05